It would be impossible to notice the numerous memoirs by which Major Rennell impressed the learned world of his time. With Sir Joseph Banks and other friends, he formed a sort of social circle for travellers and scientific men, which led to the formation of the Raleigh Club in 1827, and may be said to have formed the nucleus of the Royal Geographical Society established three years later.

Rennell's training was purely a practical one in the hard work which gave him a mastery of the technicalities of surveying and map-construction. Knowing the actual forms of sea and land at first hand, able himself to delineate them with exceptional skill, he could not make the mistakes which beset the merely theoretical student. This is still the one way to become a practical geographer, only in the present day a working knowledge of geology must be added to proficiency in the arts of observation and measurement. On such a foundation, so gained, theoretical instruction may profitably be superimposed. Mere lectures on theoretical geography, isolated lessons in the use of instruments, do not suffice to make a man a geographer, any more than lectures on theoretical chemistry and a few repetitions of the routine of simple analysis will make a man a chemist. If British geographers are to catch up and keep pace with those of the continent, they must receive systematic training in their student days, and take up geography as a serious study, as one takes up any other science. For, alas, the good old days are gone, and there is no Warren Hastings on the threshold of the twentieth century to confer pensions of £600 at the age of thirty-five on the would be Rennells of to-day! As geological students have to follow other methods than those of Murchison, so present-day geographers cannot take Rennell too literally as their model; and Mr. Markham plainly states that he looks to the labours of the University lecturers in geography to maintain the succession of British geographers. If this is to take place, there must be fresh organisation and encouragement of pure geographical research on the part of the Universities. Much progress is improbable as long as the antithesis between "geography" and "science" is a possible figure of speech. It is not so in Germany.

HUGH ROBERT MILL.

COUNTER-IRRITATION.

The Theory and Practice of Counter-Irritation. By H. Cameron Gillies, M.D. (London: Macmillan and Co., 1895.)

DR. GILLIES has selected a subject rich in literature but poor in experiment, and has treated it entirely from the literary as opposed to the experimental side. The first part of the book is devoted to a *résumé* of the literature of counter-irritation, and inflammation, which Dr. Gillies rightly considers he must not only quote, but criticise. Some of his criticisms we do not understand, some are entirely superfluous, Dr. Gillies taking up much space in demolishing theories which in the present day nobody could possibly believe in, some—and two of these we shall consider—show a want of scientific understanding.

On page 73, our attention is drawn to a paper by Dr. Hollis, published in the St. Bartholomew's Hospital Reports for 1874. Dr. Hollis showed that vesication could be produced in the Actiniæ by the local application of liquor ammoniæ. The importance of these researches consisted in the fact that they demonstrated that the living cell itself, using this term in its general sense, was capable of reacting to an irritant. It is to work done exactly on these lines by Metschnikoff[1] that we owe the modern theory of Phagocytosis. The physiology, the pharmacology, and the chemistry of the cell are presumably to Dr. Gillies, as "provoking" as he admits Dr. Hollis' monograph to be. The second class of experiments performed by Dr. Hollis demonstrated that local reaction to irritants took place in the excised tail of a newt, thus showing that this local reaction was independent of the general circulation. Dr. Gillies objects to "all such experiments, not only upon moral and humane grounds, but on the ground also that we have not been able to make sure that any good has come by them." "The tail is either dead or living, if living the result only shows that it is a living result; if dead we are not as physicians concerned with the chemistry of the action."

On page 78, our author considers an article by Dr. Lauder Brunton in the St. Bartholomew's (not the St. George's) Hospital Reports for 1875. Dr. Gillies differs from the author upon two points. First, he (Dr. Gillies) denies that inflammation can occur independently of congestion. One would have thought that this had been settled by Hollis. The discrepancy is explained when one finds, after a page's reading, what Dr. Gillies means by congestion—"an acceleration of the processes of nutrition." When arguing with a physiologist it is as well to adopt the usual physiological terminology. The second point of difference is Brunton's dictum that "pain in an inflamed part is probably due to distension of the vessels and pressure on the nerves." "The characteristic pains of neuralgia so called," says Dr. Gillies "are not easily if at all referable to the pressure from active congestion." Is a nerve which is the seat of neuralgia an inflamed part?

Dr. Gillies evidently believes that "he alone destroys who rebuilds," so we are not left merely amongst the ruins of other theories, but are provided with a "new" one. "Whatever good comes by the use of counter-irritants is because, by their irritant effects, they stimulate the activity of the tissues of the part to which they are applied and accelerate the blood supply thereto, so increasing nutrition or repair, as the need may be." This is the only new theory which we have been able to extract from chapter vii. What about the remote effects of counter-irritants? If Dr. Gillies is convinced that whether directly or remotely counter-irritants act beneficially only when they directly, or reflexly, increase the blood supply, that is at least a coherent theory; we think it quite probable that irritation of a given skin area by a blister or otherwise can give rise to reflex dilatation of the corresponding vascular area. Bradford[2] actually observed dilatation of the vessels of the kidney upon stimulating the central ends of the posterior roots of the so-called renal area, whereas stimulation of the central end of an intercostal nerve always caused contraction. Dilatation of the vessels of the splanchnic

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[1] "Leçons sur le Pathologie comparée de l'inflammation."

[2] *Journal of Physiology*, vol. x. 404.

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area has been observed upon stimulation of the central end of the sciatic nerve during chloral[1] and pyridin[2] poisoning, showing the influence exerted by the condition of the centre at the time of peripheral stimulation.

Of the second, the so-called "practical" part of the book, we have little to say. From what we have read, we regard Dr. Gillies' practice as no sounder than his theories. The reprint with which he provides us of Dr. Davies' original communication on blistering in acute rheumatism, and the controversy thereon, is the most interesting part of the book. We should like to know who it is who believes that the "serum" is "*abundantly* charged with lactic acid" in acute rheumatism; and, supposing it was, how much one is likely to get from the serum, say, of half a dozen blisters? (p. 88.) To sum up our remarks, we do not consider the book of value either to physicians or physiologists. The facts it contains are not new, and the theories do not justify their existence, since they fail to fulfil the conditions which should be demanded of all hypotheses, viz. to indicate lines of research which shall offer a reasonable hope of increasing our knowledge. One merit which it possesses, is that it may draw attention to some valuable pieces of work which might perhaps otherwise have been disregarded.

F. W. T.

A NEW DEPARTURE IN GEOMETRY.

Die Grundgebilde der ebenen Geometrie. By Dr. V. Eberhard, Professor at the University of Königsberg i.P. Bd. I. 8vo. xlviii. + 302 pp. Five plates. (Leipzig: Teubner, 1895.)

THE history of Analytical Geometry affords a curious subject of study to the thoughtful mathematician. It would seem that equations between coordinates were first used to express spatial relations discovered by intuitional processes, and the equations were combined algebraically to discover other implied spatial relations. For this purpose it was necessary to interpret in geometrical terms equations arrived at by algebraic processes from geometrical data, and the facility thus acquired led men to seek for similar interpretations of equations set down without reference to geometrical conditions. Hence it happens that modern developments of Analytical Geometry appear rather to present algebraic facts in geometrical language than to deduce results that can be apprehended by intuition from data of intuition. Such a notion as that of a cubic surface, for instance, would seem to be essentially analytical, and although it has been proved possible to arrange a geometrical construction for an algebraic curve whose equation is given, yet the construction arrived at is so artificial that intuition fails to grasp by its aid the necessary form of the curve. Looking at the subject in this way, it seems hardly too much to say that the algebra which was designed to be the servant of the geometer has become his master.

Some such reflections as these form the starting-point of Dr. Eberhard's work. The volume under notice is to be the first of a series, and in his long preface[3] he sets forth his aim and method. Here, after tracing the origin in experience of simple geometrical notions such as those of the straight line and the plane, he divides curves and surfaces into two classes, the regular (gesetzmässig) and the fortuitous (zufällig), and proceeds to inquire after intuitional criteria available for distinguishing between them. He defines a regular locus as one in which a relation that can be apprehended by intuition connects a variable point of the locus with a finite number of points fixed in it. The kind of relation which he admits as capable of being apprehended by intuition is essentially topographical. This will be elucidated by considering the example he gives. Let a system of points be taken, and let planes be drawn through them three by three. These planes will in general intersect in other points besides those of the original system. Let planes be now drawn through the points of the extended system three by three. These planes will again intersect in some new points, and the process can be continued. Let the process be arrested at any stage, and suppose a set of four points of the extended system lie in one plane. If one of the points of the original system were slightly displaced these four points would generally cease to lie in one plane, but if the particular point of the original system were displaced on a certain surface, the four points would remain in a plane. This property constitutes a definition of the surface available for intuitional geometry. It will be seen from the example that the method rests upon the topographical relations of systems of points.

The description of these relations for a given system can be carried out systematically, and the process consists in the use of two related notions. The first is the notion of "characteristics," and the second is the notion of the "index" of a point in a plane system. If three points out of four are taken in a definite order, the triangle formed by them is described in the positive or negative sense by an observer on the same side of their plane as the fourth point. The sense of description of the triangle formed by three points in a definite order for an observer on a definite side of their plane is the characteristic of the three. The index of a point in a plane system is the order in which a line turning about that point meets the other points of the system. A statement of the indices simplifies the problem of stating the characteristics.

The bulk of the present volume is taken up with theorems concerning the characteristics and index-systems of groups of points in a plane, and they are fully exemplified in the cases of groups of four, five, and six points. In an investigation of so novel a character we find, as we might expect, original methods of working and difficult arguments. The want of figures in illustration of the earlier chapters, and some of the notations employed, combine with the nature of the subject to render the book difficult to read.

The endeavour to make the geometry of curves and surfaces of high degrees more intuitive is laudable, a new classification of loci founded on geometric rather than algebraic principles is also a worthy object of research, and the idea of grounding such a classification in topographical circumstances is ingenious; but a final judgment as to Dr. Eberhard's success in these directions can only be pronounced after his complete work has been given to the world.

A. E. H. L.

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[1] Foster's "Physiology," 4th edition, p. 205.

[2] Brunton and Tunnicliffe, *Journal of Physiology*, xvii. p. 272.

[3] The first twenty-nine pages of this preface are separately published as a tract, with the title "Über die Grundlagen und Ziele der Raumlehre."

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